FIELD INSTRUMENTATION AND TESTING

Federal Aviation Administration

Presented to: 2010 FAA Worldwide Airport Technology Transfer Conference

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PRESENTATION OUTLINE

- Introduction
- Current Projects – DIA, ATL, LGA
- Future Proposed Projects
- Coordinating Instrumentation and Construction
- Instrumentation
- Summary

RPD – 137
FIELD INSTRUMENTATION & TESTING

Outcome

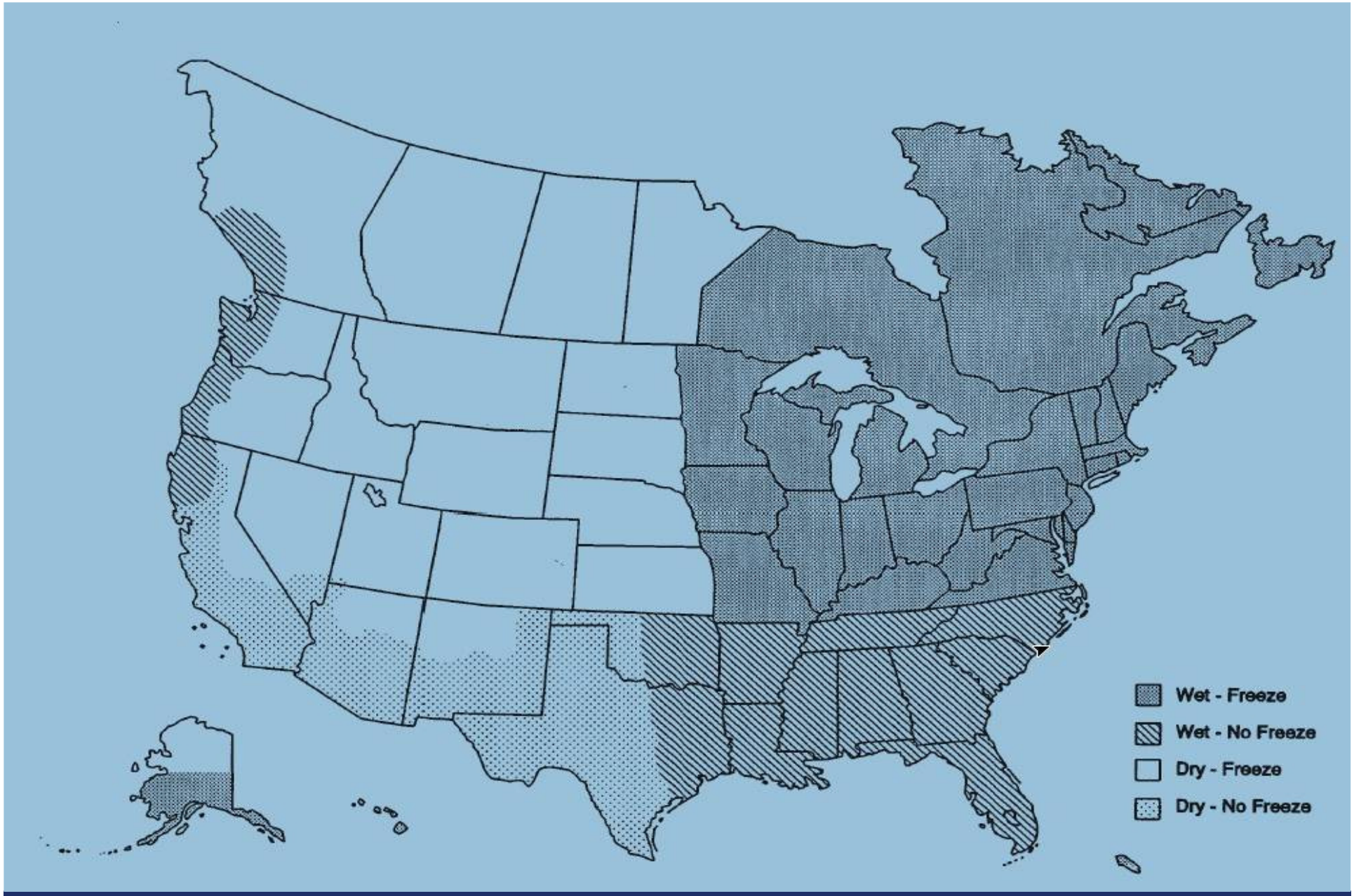
- More durable, long-lived airport pavements
- Reduced downtime due to construction & maintenance activities

Rationale

Better understanding of long term pavement behavior in the field under varied climatic and operating conditions, and improved paving materials characterization will conserve airport development funds and reduce the downtime of runways from construction and maintenance activities.

FIELD INSTRUMENTATION AND TESTING

- Type of data to be collected:
  - Climatic data (pavement & air temperatures).
  - Pavement response data (strains, deflections).
  - Material samples for laboratory testing.
  - In-situ test data (non-destructive tests, vane shear, dynamic cone penetrometer, etc.).
  - Heavy Weight Deflectometer tests.


Wet - Freeze
Wet - No Freeze
Dry - Freeze
Dry - No Freeze

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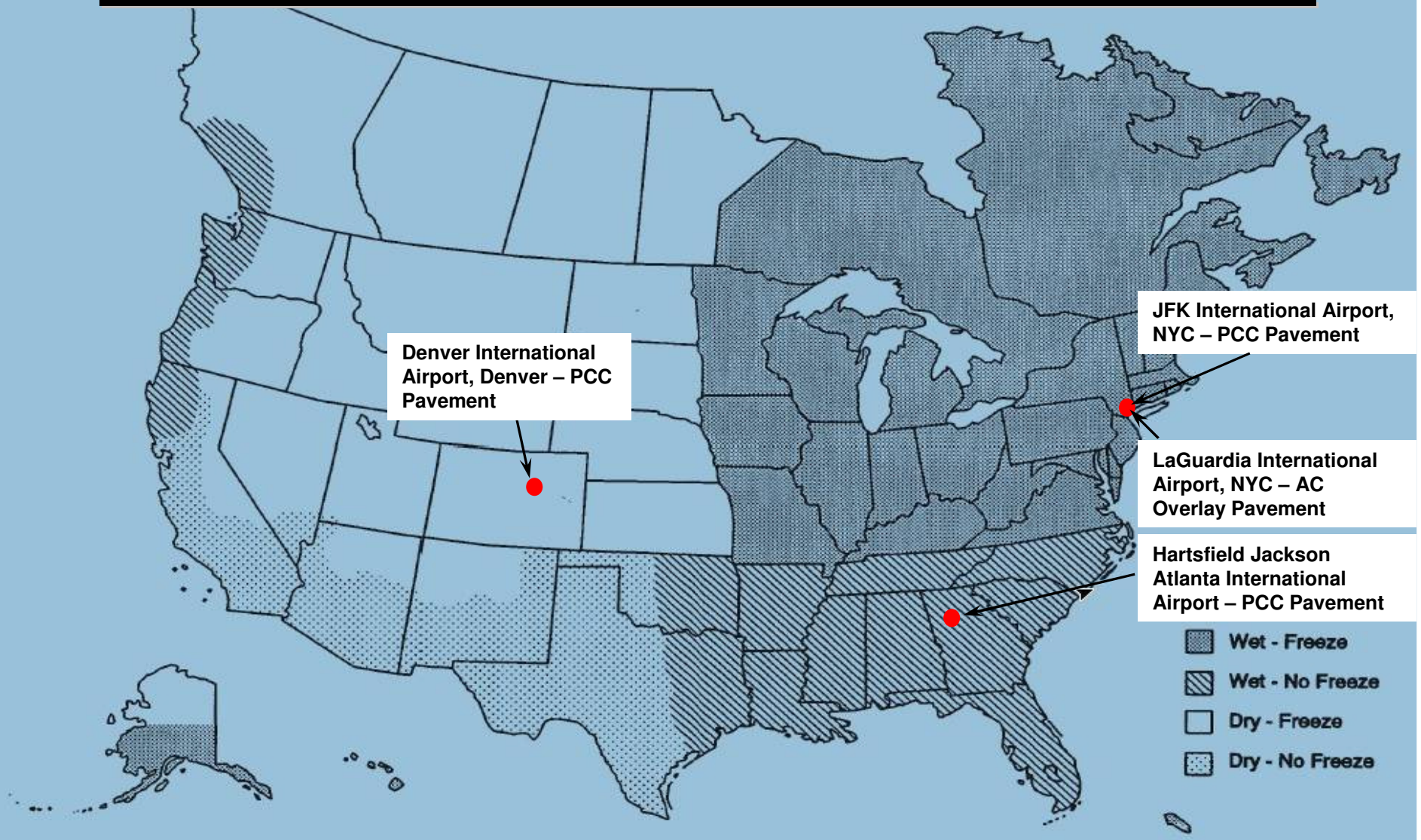
Current FAA Airport Instrumentation Projects

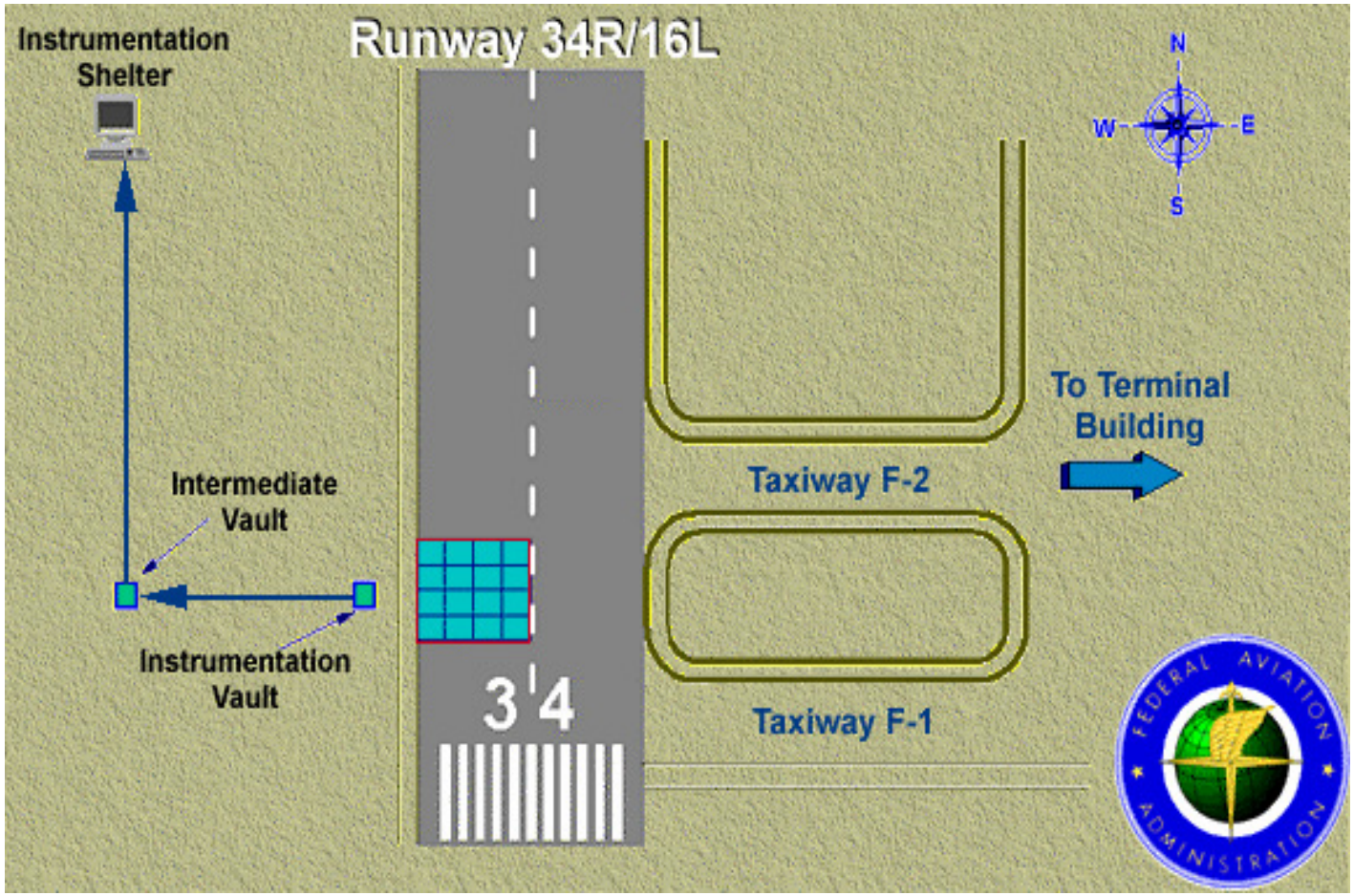


DIA INSTRUMENTATION PROJECT

- Initiated in 1992.
- Focused on measuring PCC pavement responses due to different loading conditions
  - Aircraft; and
  - Environment (temperature/moisture).
- 16 slabs in the take-off area of Runway 34R-16L instrumented.

DIA INSTRUMENTATION PROJECT

-460 static and dynamic sensors installed.



DIA INSTRUMENTATION PROJECT

- Automatic data collection: 1995 through 1999.
- Data collected during this time period included
  - real-time pavement responses to actual aircraft traffic; and
  - environmental parameters and weather conditions.

DIA INSTRUMENTATION PROJECT

- The collected data were processed and converted into engineering units for use by pavement researchers.

- Pavement inspections, including falling-weight-deflectometer (FWD) tests, continue to be conducted periodically and added to the database.

DIA INSTRUMENTATION PROJECT

The collected data were used for

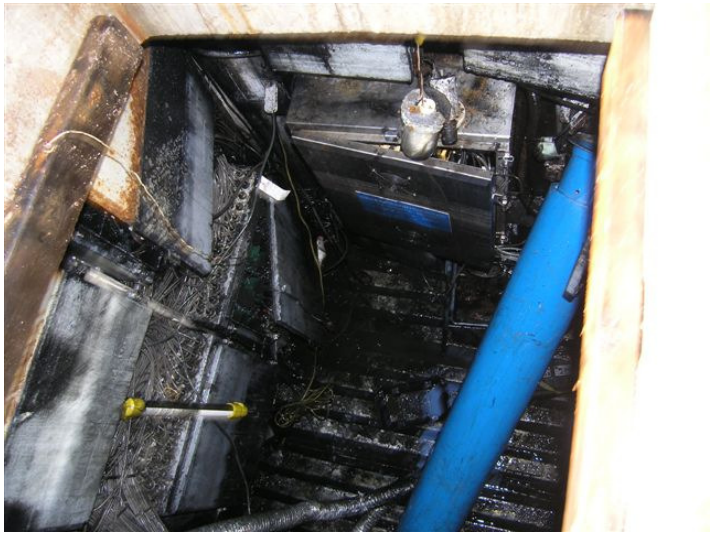
- comparing measured responses with existing theoretical models.
- validating and calibrating structural model in FAARFIELD (new FAA pavement thickness design software).

The analyses of data collected from DIA showed that the instrumentation of an in-service airport pavement allows not only the evaluation of existing structural models to predict pavement responses, but also studying the

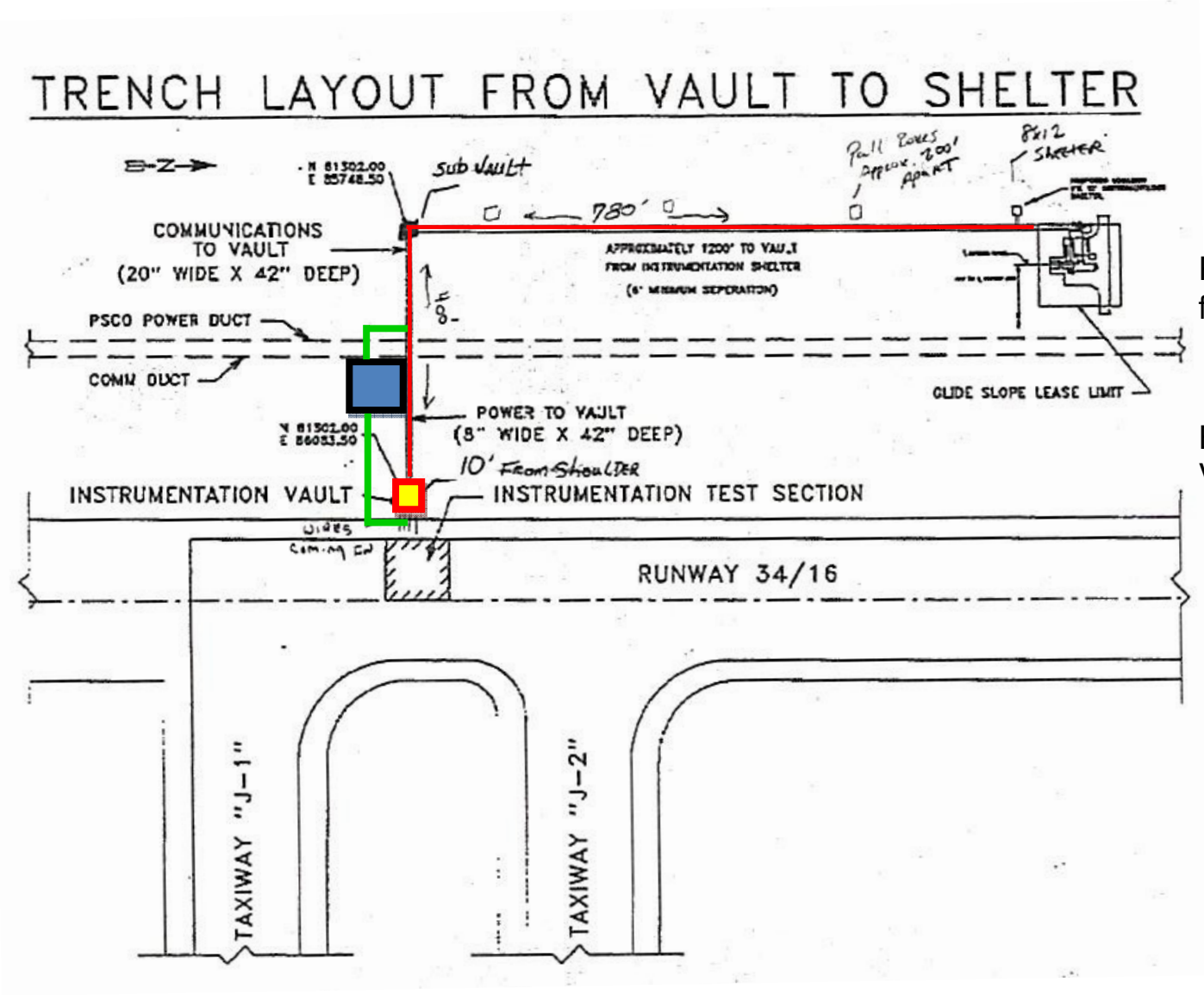
- *Changes in responses over time;*
- *Effects of aircraft type and gear; and*
- *Effects of environment.*

NAPTF data coupled with data from field instrumentation projects will help in designing longer lasting and better performing airport pavements.

STATE OF DIA INSTRUMENTATION VAULT



REVITALIZATION OF DIA INSTRUMENTATION PROJECT



Proposed Location (200- ft from shoulder)

Existing Instrumentation Vault (10-ft from shoulder)

OVERALL PLAN

- Prepare Vault for entry
- Sensor Assessment
- New Site(s) Preparation
- System Relocation
- System Documentation

STATE OF DIA INSTRUMENTATION VAULT

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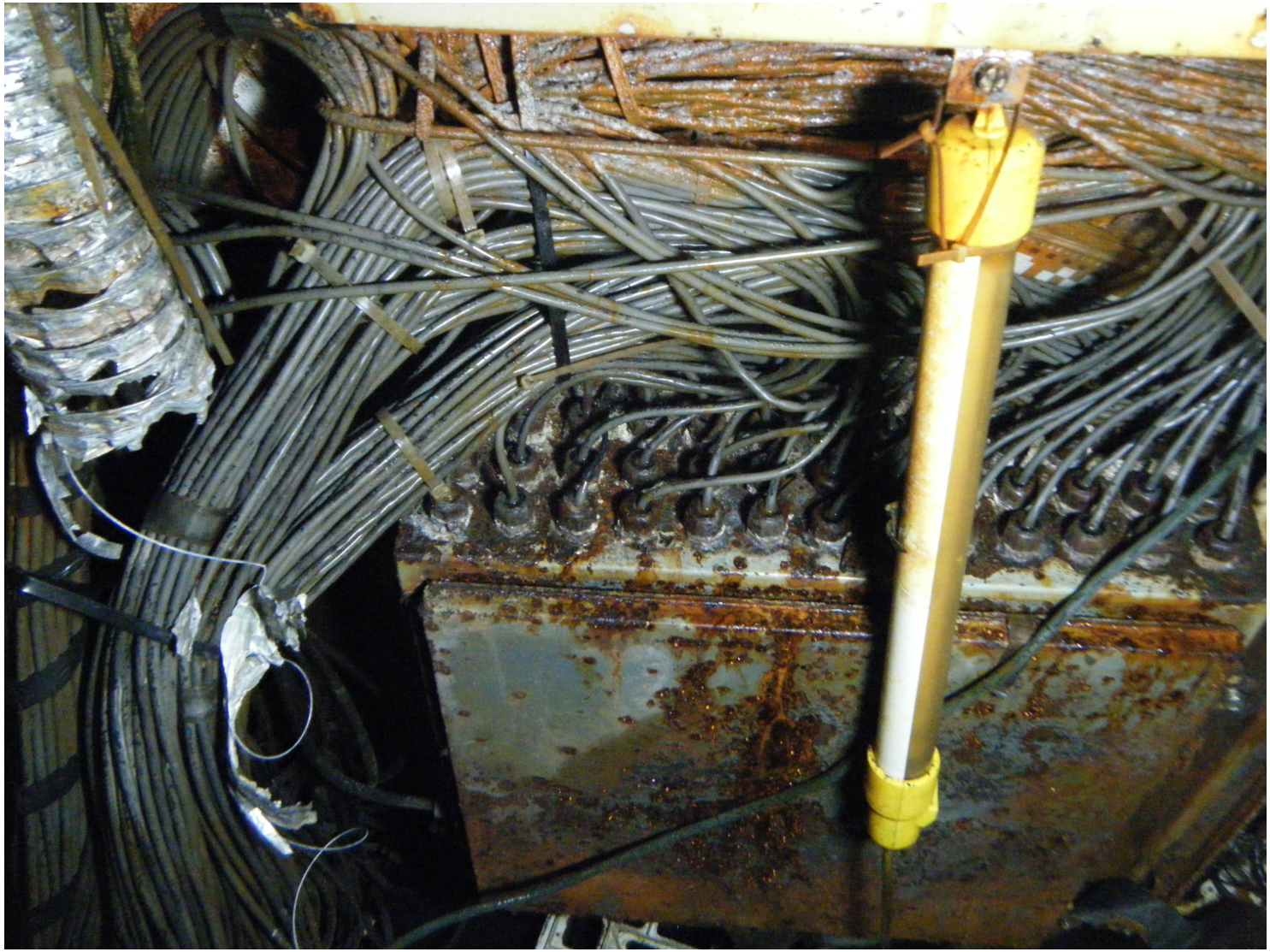


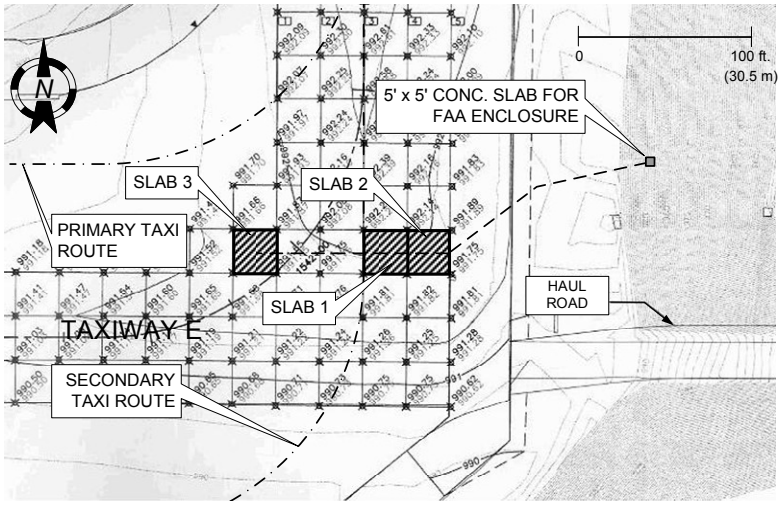
STATE OF DIA INSTRUMENTATION VAULT

STATE OF DIA INSTRUMENTATION VAULT

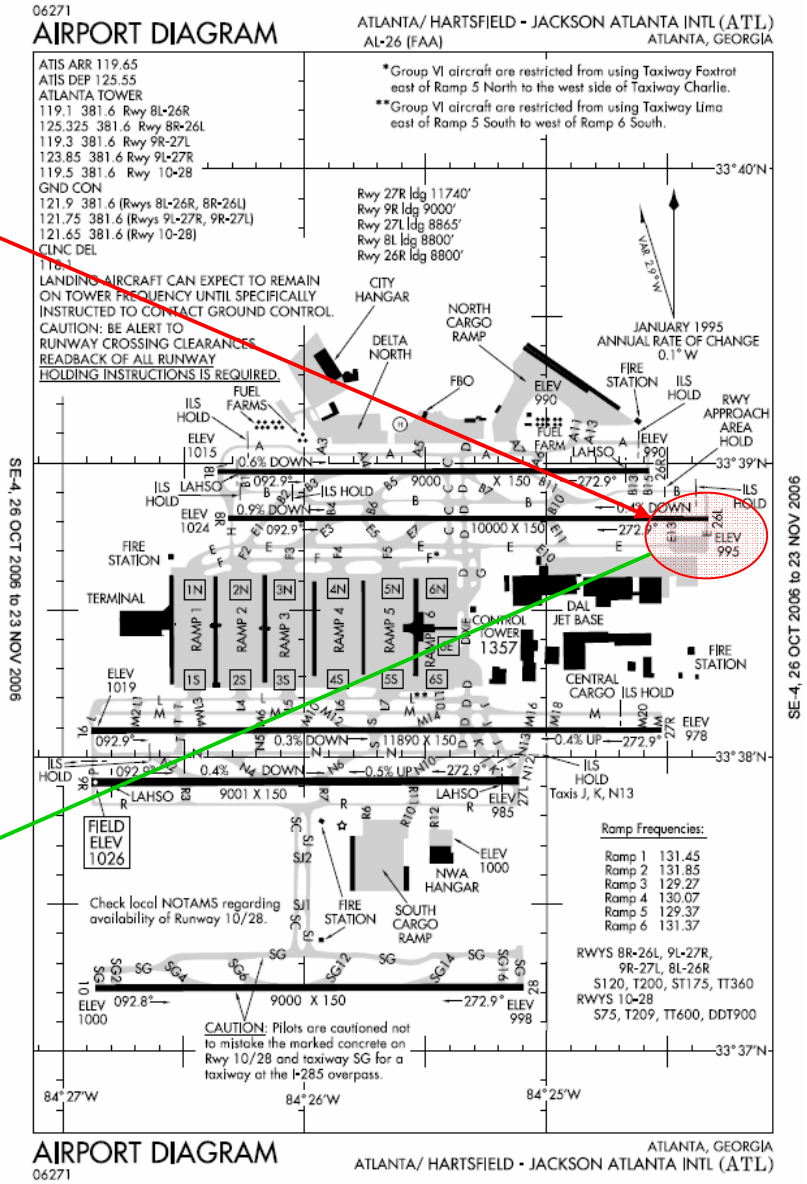
Atlanta Taxiway E Instrumentation

- **Background: 3 PCC slabs at Atlanta HJIA Taxiway E were instrumented in 2006.**
- **Objective - to monitor long term vertical slab movement.**
- **Sensors included strain gages, vertical displacement transducers (VDT) and temperature gages.**

Project Location

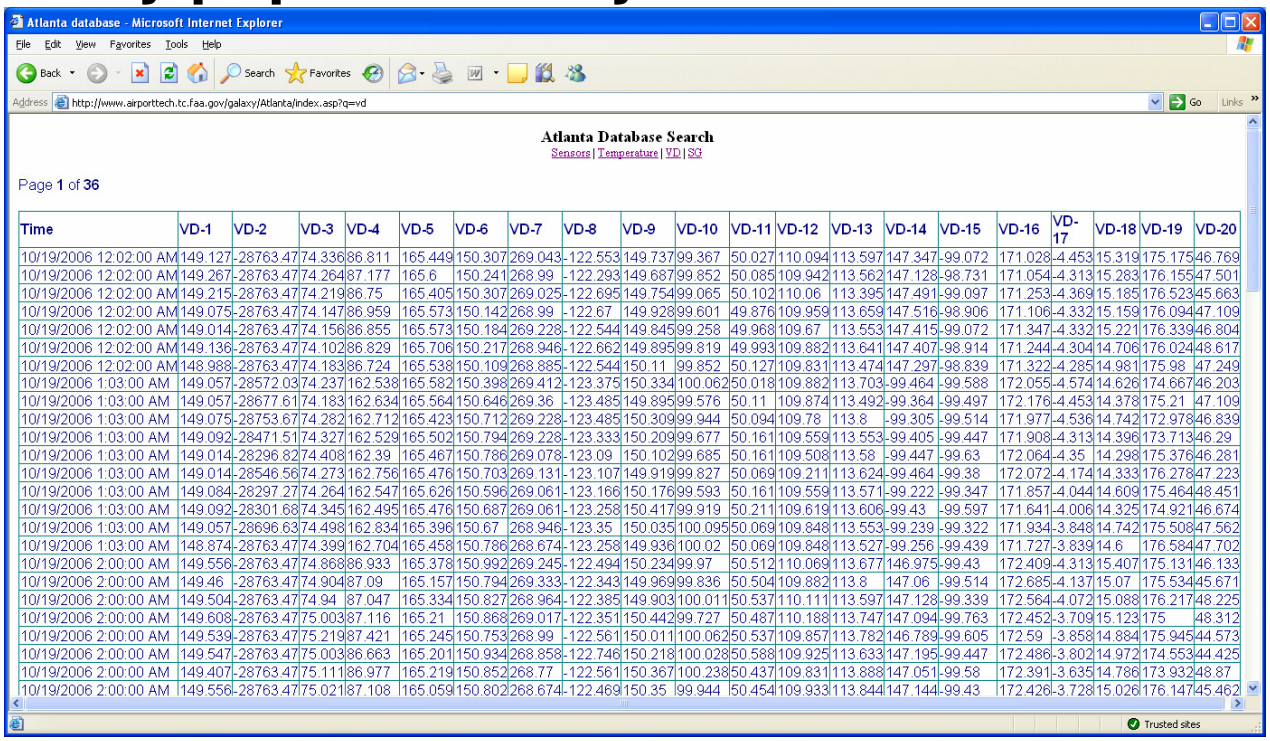


Taxiway E



Atlanta Database

- **Searchable SQL database under construction.**
- **Currently populated only for 10/2006 thru 3/2007.**



Atlanta database - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites

Address http://www.airporttech.tc.faa.gov/galaxy/Atlanta/index.asp?q=vd

Go Links

Atlanta Database Search

Sensors | Temperature | VD | SG

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Time	VD-1	VD-2	VD-3	VD-4	VD-5	VD-6	VD-7	VD-8	VD-9	VD-10	VD-11	VD-12	VD-13	VD-14	VD-15	VD-16	VD-17	VD-18	VD-19	VD-20
10/19/2006 12:02:00 AM	149.127	-28763.47	74.336	86.811	165.449	150.307	269.043	-122.553	149.737	99.367	50.027	110.094	113.597	147.347	-99.072	171.028	-4.453	15.319	175.175	46.769
10/19/2006 12:02:00 AM	149.267	-28763.47	74.264	87.177	165.6	150.241	268.99	-122.293	149.687	99.852	50.085	109.942	113.562	147.128	-98.731	171.054	-4.313	15.283	176.155	47.501
10/19/2006 12:02:00 AM	149.215	-28763.47	74.219	86.75	165.405	150.307	269.025	-122.695	149.754	99.065	50.102	110.06	113.395	147.491	-99.097	171.253	-4.369	15.185	176.523	45.663
10/19/2006 12:02:00 AM	149.075	-28763.47	74.147	86.959	165.573	150.142	268.99	-122.67	149.928	99.601	49.876	109.959	113.659	147.516	-98.906	171.106	-4.332	15.159	176.094	47.109
10/19/2006 12:02:00 AM	149.014	-28763.47	74.156	86.855	165.573	150.184	269.228	-122.544	149.845	99.258	49.968	109.67	113.553	147.415	-99.072	171.347	-4.332	15.221	176.339	46.804
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10/19/2006 1:03:00 AM	149.057	-28677.61	74.183	162.634	165.564	150.646	269.36	-123.485	149.895	99.576	50.11	109.874	113.492	-99.364	-99.497	172.176	-4.453	14.378	175.21	47.109
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10/19/2006 1:03:00 AM	149.014	-28296.82	74.408	162.39	165.467	150.786	269.078	-123.09	150.102	99.685	50.161	109.508	113.58	-99.447	-99.63	172.064	-4.35	14.298	175.376	46.281
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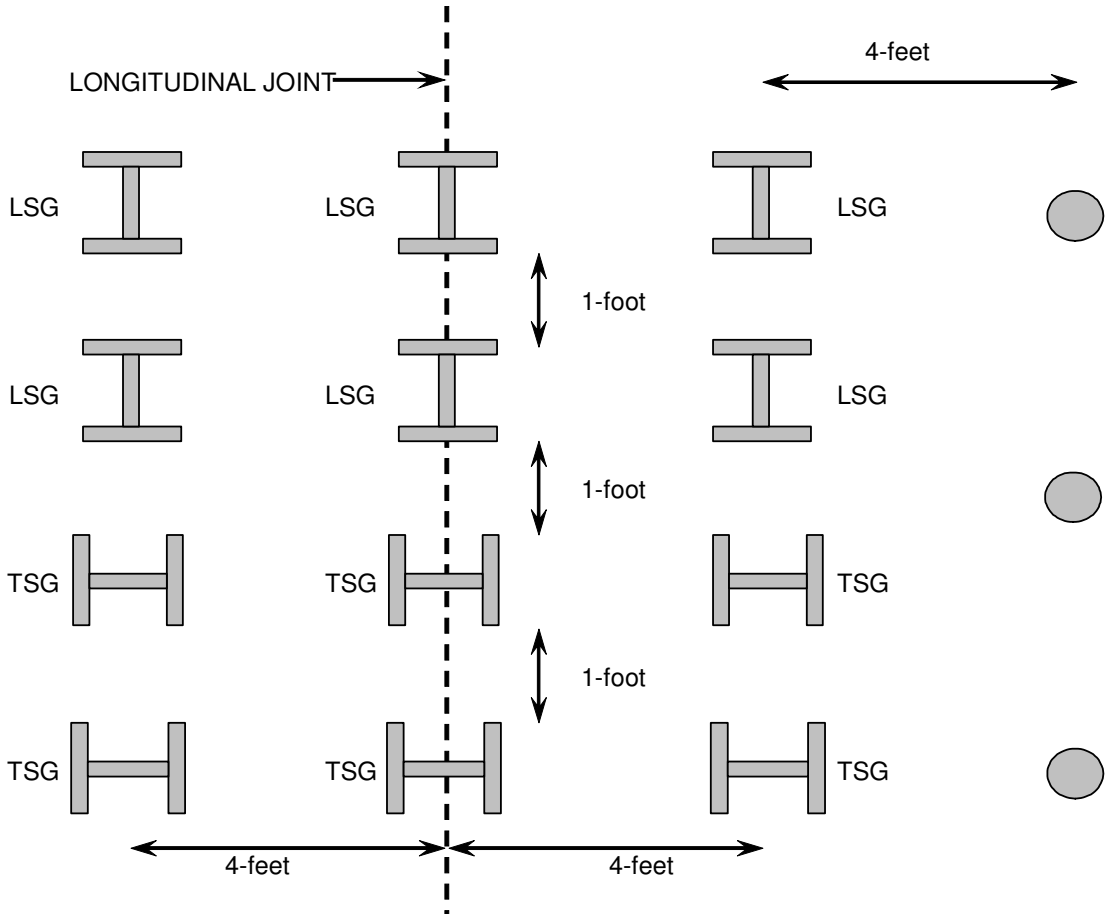
10/19/2006 2:00:00 AM	149.556	-28763.47	75.021	87.108	165.059	150.802	268.674	-122.469	150.35	99.944	50.454	109.933	113.844	147.144	-99.43	172.426	-3.728	15.026	176.147	45.462

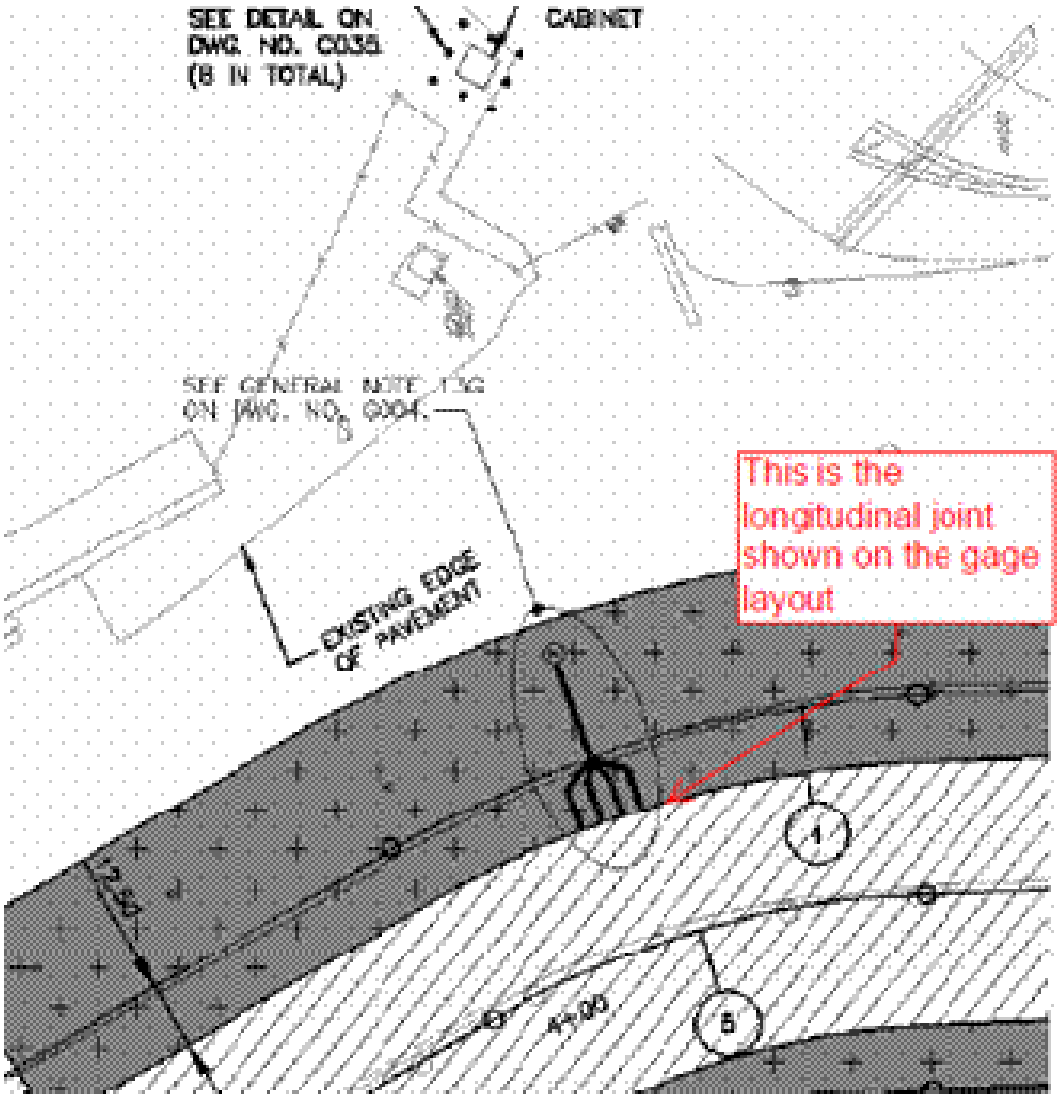
Trusted sites

LaGuardia International Airport Project

- In cooperation with Port Authority of NY & NJ.
- La Guardia Airport, New York
  - Taxiway Bravo
- Focus on longitudinal joints.
- Asphalt strain gages and thermistors.

Proposed Project Area TW A-A


LONGITUDINAL JOINT
4-feet
LSG
LSG
LSG
1-foot
LSG
LSG
LSG
1-foot
TSG
TSG
TSG
1-foot
TSG
TSG
TSG
4-feet
4-feet


SEE DETAIL ON
DWG. NO. C035
(8 IN TOTAL)
CABINET
SEE GENERAL NOTE 15G
ON DWG. NO. G004.
EXISTING EDGE
OF PAVEMENT
This is the
longitudinal joint
shown on the gage
layout
12.50'
4+00
1
8

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Other Airports Under Consideration

- JFK, NY –
  Runway 13R-31L Reconstruction Project


Runway 13R-31L
John F Kennedy International Airport
Gateway National Recreation Area
Head of Bay
Bergen Basin
Idlewild Park
Brookville Park
Springfield Park
Conselyeas Pond
Thurston Basin
North Woodmere Park
Inwood Country Club
Inwood
Laurelton
Brookville
Rosedale
St Marys
Nassau Expy
Shore Pkwy
Belt Pkwy
N Conduit Ave
135th Ave
147th Ave
Rockaway Blvd
Van Wyck Expy
New York Blvd
Farmers Blvd
Brookville Blvd
Rockaway Turnpike
Bay Blvd

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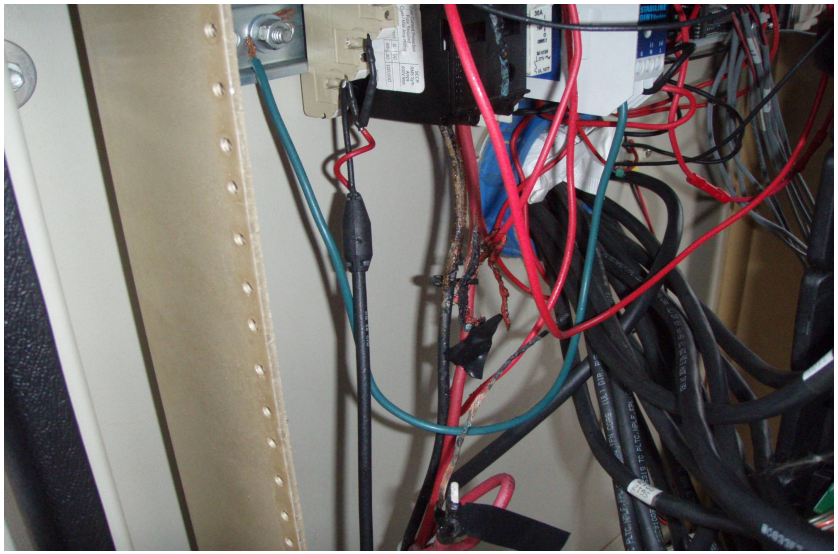
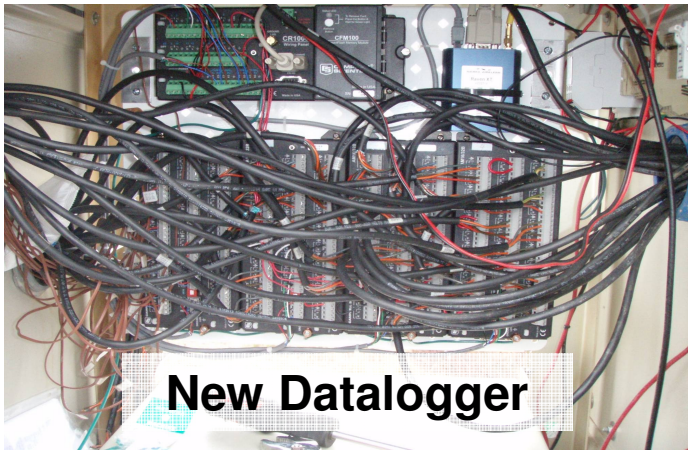
2007: Damage to System



January 2009: Replaced Data Acquisition System

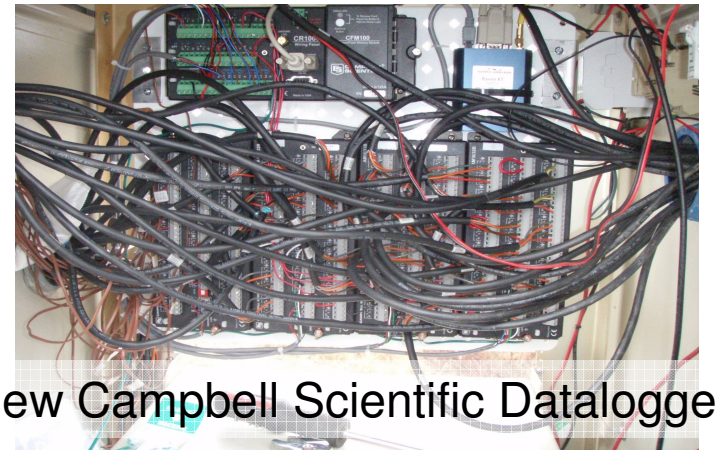
- New Campbell Scientific datalogger.
- Simpler, more robust.
- Designed for remote applications.
- No laptop controller.
- Significantly lower power requirements than old IOTech system.

Old IOTech Data Acquisition System

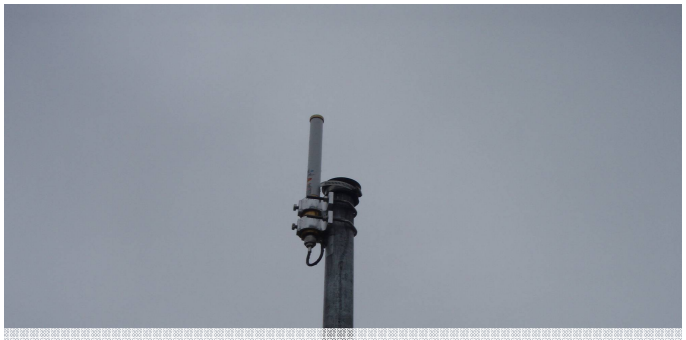


New Datalogger

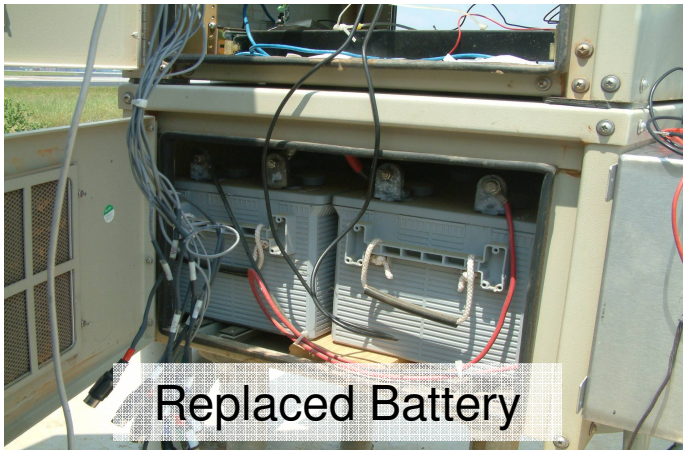
Upgrades and Maintenance



New Campbell Scientific Datalogger



Cell Modem Antenna Mounted on Wind Turbine Mast



Replaced Battery

New Solar Panel & Protective Screen

THANK YOU